WE CLAIM:

1. An Adaptive Knowledge Management System for assisting a user with decision making by providing real-time, on-line automated recommendations for actions in a monitored vehicle troubleshooting, performance trend monitoring, health management and preemptive maintenance domain diagnostics and prognostics, comprising:

a Structured Knowledge Repository constructed from models, historical data, and heuristics for organizing a model domain knowledge;

a plurality of Analytical and Machine Learning tools capturing knowledge from data sources and populating cells of the Structured Knowledge Repository;

a Mixed-Initiative Planning module interpreting operation goals for the monitored vehicle and utilizing the Structure Knowledge Repository for developing recommendations for user decision making; and

a plurality of Mixed-initiative Decision Support tools using a feedback from the Mixed-Initiative Planning module and querying the Structured Knowledge Repository for incorporating the extracted knowledge and information into outputs dealing with current issues and contingencies.

2. The system according to Claim 1, wherein the Analytical and Machine Learning tools use a machine learning technique appropriate for the data source to extract information, with the technique being symbolic, empirical, or hybrid, domain-dependent or domain-independent, and run in supervised or unsupervised modes.

3. The system according to Claim 1, wherein the Structured Knowledge Repository represents the model domain knowledge in Abstraction-Decomposition Space format, and using constraints, capabilities, relationships as prioritized means-ends rows, and physical organization as prioritized whole-part columns.

4. The system according to Claim 3, wherein the means-ends rows have goals at the highest abstraction level, then abstract functions that typically contains first-principles equations, general functions with information about the generalized engineering, physical functions with information about the specific engineered subsystems and components, and physical forms with module physical characteristics, and the whole-part columns having system at the highest aggregation level, then units, and components.

5. The system according to Claim 1, wherein the Mixed-Initiative Planning module further includes creating predictions of behavior models through correlation and pattern recognition, and developing a prioritization scheme using artificial intelligence rules prioritization techniques.

6. The system according to Claim 1, wherein the Mixed-Initiative Decision Support tools create the outputs usable for vehicle design, adjust factory production set points, improve maintenance schedules, improve fleet management, and make predictions.

7. A method usable in an Adaptive Knowledge Management System for assisting a user with decision making by providing real-time, on-line automated recommendations for actions in a monitored vehicle troubleshooting, performance trend monitoring, health management and preemptive maintenance domain diagnostics and prognostics, comprising the following steps:

(a) constructing a Structured Knowledge Repository from models, historical data, and heuristics for organizing a model domain knowledge;

(b) using a plurality of Analytical and Machine Learning tools for capturing knowledge from data sources and populating cells of the Structured Knowledge Repository;

(c) using a Mixed-Initiative Planning module for interpreting operation goals for the monitored vehicle and utilizing the Structure Knowledge Repository for developing recommendations for user decision making; and

(d) using a plurality of Mixed-initiative Decision Support tools for utilizing a feedback from the Mixed-Initiative Planning module and querying the Structured Knowledge Repository, for incorporating the extracted knowledge and information into outputs dealing with current issues and contingencies.

8. The method according to Claim 7, wherein the step of using the Analytical and Machine Learning tools includes using a machine learning technique appropriate for the data source to extract information, with the technique being symbolic, empirical, or hybrid, domain dependent or domain independent, and run in supervised or unsupervised modes.

9. The method according to Claim 7, wherein the Structured Knowledge Repository represents the model domain knowledge in Abstraction-Decomposition Space format, and uses constraints, capabilities, relationships as structured means-ends rows, and physical organization as structured whole-part columns.

10. The method according to Claim 9, wherein the means-ends rows have goals at the highest abstraction level, then abstract functions with equations, general functions with information about the general engineering, physical functions with information about the specific engineered subsystems and components, and physical forms with module physical characteristics, and the whole-part columns having system at the highest aggregation level, then units, and components.

11. The method according to Claim 7, wherein the step of using the Mixed-Initiative Planning module further includes creating predictions of behavior models through correlation and pattern recognition, and developing a prioritization scheme to tradeoff competing goals and resource limitations.

12. The method according to Claim 7, wherein the step of using the Mixed-Initiative Decision Support tools includes creating the outputs usable for vehicle design, adjusting factory production set points, improving maintenance schedules, improving fleet management, and making predictions.